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ABSTRACT

The aims of this research were to: investigate teachers' needs for knowledge and skills in relation to the effective use of Information and Communications Technology (ICT), and suggest ways of enhancing future design and delivery of self- and staff-development in order to increase and improve the level of ICT use in Scottish schools. First, a survey of primary and secondary teachers was undertaken to provide basic data on the current levels of ICT use in schools, teachers' experience of ICT training to date, and their perceptions of their ICT knowledge and skills needs. A number of scenario interviews were carried out to provide a more in-depth understanding of these issues and the contextual factors which influence teachers' responses to ICT and ICT training. Interviews were also held with technicians and librarians in secondary schools; headteachers were surveyed on their perceptions of the needs of teachers, and school ethos and policies on ICT, and a short questionnaire survey of education authorities was conducted. The study highlighted a number of issues relating teachers' use and requirements of, and attitudes to ICT. These findings are grouped and discussed in this report under the following subject headings: use of ICT; problems and challenges; attitudes, skills and training; and organizational culture. Recommendations relating to training and development; ready access to ICT; and ongoing support and advice beyond initial training are provided. (AEF)

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Interchange 58

Teachers' ICT Skills and Knowledge Needs

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Teachers' ICT Skills and Knowledge Needs

Dorothy Williams, Kay Wilson, Amanda Richardson, Jennifer Tuson and Louisa Coles; The Robert Gordon University

In light of current developments such as the National Grid for Learning (NGfL), and funding for training recently becoming available for teachers and librarians, it is clearly vital to understand teachers' ICT skills and knowledge needs, to discover their priorities for future development and to establish what will encourage teachers to adopt ICT where appropriate in their professional lives as classroom practitioners, as planners and managers and as learners. To this end, The Scottish Office Education and Industry Department commissioned this research project which was conducted between October 1997 and April 1998.

Context

The value of Information and Communications Technology (ICT) for teaching and learning has been a point of emphasis for some time. It is clearly integral to both the 5-14 Development Programme and Higher Still in which information technology is identified as one of the core skills areas. While it can be assumed that specific forms of ICT will change with time, the need to evaluate and use ICT purposefully will remain the key to full participation in an information society.

Aims of the study

The aims of the research were to:

- investigate teachers' needs for knowledge and skills in relation to the effective use of ICT
- suggest ways of enhancing future design and delivery of self- and staff-development in order to increase and improve the level of ICT use in Scottish schools.

Approach

The study was conducted in two parts:

- first, a survey of primary and secondary teachers was undertaken to provide basic data on the current levels of ICT use in schools, teachers' experience of ICT training to date, and their perceptions of their ICT knowledge and skills needs
- second, a number of scenario interviews were carried out to provide a more in-depth understanding of these issues and the contextual factors which influence teachers' responses to ICT and ICT training.

Interviews were also held with technicians and librarians in secondary schools in order to gain a view of teachers' ICT needs from those who are often seen as the source of ICT advice and support in school. In addition, to obtain a broader pic-

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ture, headteachers were surveyed on their perceptions of the needs of teachers, and school ethos and policies on ICT. A final tier of evidence was collected through a short questionnaire survey of education authorities. This provided the research team with a brief overview of plans, priorities and ethos within Scottish authorities in relation to ICT in schools. Follow-up interviews were held with representatives of the education authorities to learn more about particular initiatives, training approaches, and/or issues emerging from the initial survey.

Summary of findings

The study highlighted a number of issues relating teachers' use and requirements of, and attitudes to, ICT. These findings have been grouped under the four subheadings:

- use of ICT
- problems and challenges
- attitudes, skills and training
- organisational culture.

Use of ICT

In general, teachers' use of ICT appears to be quite low with very little use of the Internet and e-mail.

Do you feel that you would benefit from expanding your use of ICT?

We discovered that:

- use of ICT is relatively low and is focused on a fairly narrow range of ICT. ICT is used most frequently in primary and secondary schools for word-processing. There is very little use of the Internet and WWW or e-mail by either primary or secondary teachers, despite the fact that the majority of secondary schools have access to the Internet (see figures 1 & 2 on P4)
- primary teachers use ICT primarily to support classroom practice; in contrast secondary teachers use it as much or more for professional development and personal use as in the classroom
- teachers are using ICT throughout the curriculum but usage and attitude varies in secondary schools between subject areas. Mathematics and science teachers use ICT relatively little while, amongst non-computing teachers, ICT is used most by teachers of business management studies
- those who use computers at home tend to use ICT more in school
- teachers recognise a range of benefits from the use of ICT for pupils and for themselves, for example, in providing additional information, aiding presentation (themselves and pupils) and the motivational element of ICT
- ICT is still seen as an extra or add-on rather than an integrated resource within teaching; many teachers are still concerned with 'teaching ICT' rather than 'teaching with ICT'.

Problems and challenges

Classroom management issues are the focus of much concern in relation to ICT.

How can you make sure that pupils in your school have fair and equal access to ICT?

A number of problems and issues emerged from our research regarding teachers' use of ICT, centring around the lack of access to, or problems with the availablity of, hardware or software, and users' own lack of familiarity, skills and knowledge, for example:

- classroom management issues are the focus of much concern in relation to ICT; providing fair and equal access for all pupils when hardware is limited is seen as a major challenge
- the perceived expense of ICT, relative to more traditional resources, creates tensions in terms of prioritising budgets for hardware and software; the problem of hardware becoming obsolete raises concerns in relation to long-term planning, training and budgeting
- teachers of lower primary levels feel that upper primary levels have greater priority when it comes to the allocation of ICT resources
- more appropriate information and ICT management strategies can offer solutions to problems in evaluation of ICT resources and organisation and access to ICT resources; primary schools appear to be better equipped in terms of resource sharing across the school than are secondary schools
- technical support and advice on selecting ICT resources is badly needed
- lack of ICT support is seen as a particular problem in primary schools and rural schools.

Attitudes, skills and training

Teachers demonstrated a range of attitudes towards the use of ICT, for example:

- although attitudes towards ICT are mixed, overall teachers are generally positive and the vast majority want to develop their ICT skills and knowledge
- teachers of non-computing subjects have basic ICT competence but do not feel competent enough to rely on ICT as a core teaching medium
- teachers feel they need training which is:
  - i) relevant to the stage or curriculum they are teaching, their own stage of ICT development and appropriate to the technology which they have available to them
  - ii) of good quality, with hands-on experience, plenty of help and guidance, and opportunities to work with, and share ideas with, other colleagues
- to gain maximum benefit from training, teachers feel they need opportunities, time and ongoing support
- teachers rely heavily on their colleagues, including librarians and technicians, to help them keep up to date with ICT
- teachers need to be aware of a broader range of ICT than they are at present using: without this awareness, many feel they cannot assess their own ICT development needs
- teachers report a need for technical skills and knowledge in using the ICT resources they have available to them; but they also want to know more about how to apply that knowledge within the curriculum.

Teachers feel that they need good quality training that is relevant to their own environment, their own stage of development and the section of the curriculum they teach.

What kind of ICT development would be appropriate to your situation?

Organisational culture

The ethos inside a school can influence how ICT is portrayed, for example:

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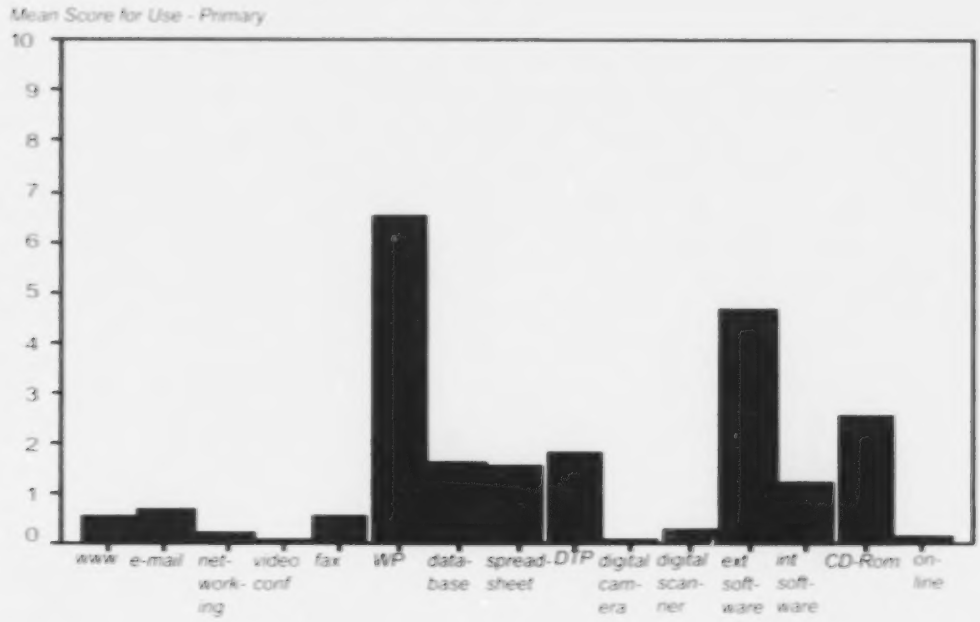
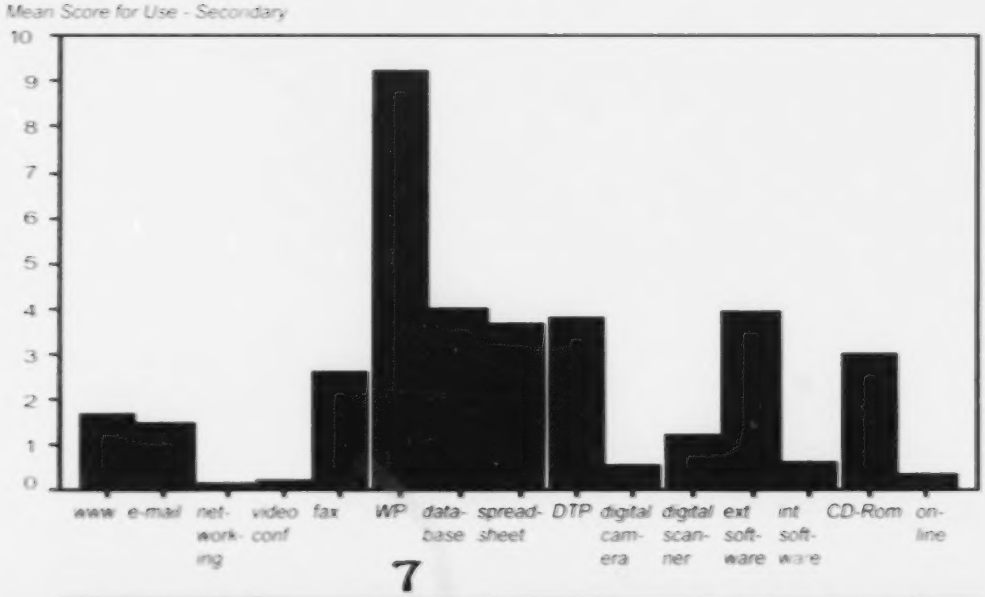
Figure 1: Use of ICT by Primary Teachers



Teachers were asked to indicate their frequency of use for each of 15 types of ICT resources listed in each of four contexts: classroom practice, professional development, personal use and administration. Their response were scored as follows: Daily = 4, Weekly = 3, Monthly = 2 and Termly = 1, with 'never' being given a score of zero. An average score was then derived for each resource in order to compare frequency of use of the different resources.

Key to abbreviations:
WWW: World Wide Web; Networking: network computer conferencing, e.g. First Class; Video conf: video conferencing; DTP: Desktop publishing; Ext software: externally produced educational software packages (e.g. simulations and educational games); Int software: internally produced educational software packages; Online: online information sources (e.g. British Education Index).

Figure 2: Use of ICT by Secondary Teachers



- teachers recognise the importance of a positive environment and the value of key enthusiasts in helping to promote ICT
- the attitude and support of senior management, particularly headteachers, is as a key to the development of teachers' ICT skills and knowledge; however, they are still some way from providing the kind of supportive environment which is likely to promote effective use of ICT.
- headteachers and education authorities consider ICT to be important and ICT training for teachers to be a priority
- education authorities and headteachers appear to be generally in tune with teachers in terms of identifying skills and knowledge needs: they identify a need for teachers to develop more technical skills and knowledge though they also consider the most effective training to be curriculum based
- some headteachers and education authorities have mixed feelings about the value of whole-school policies on ICT but many schools and authorities have policies or are developing them; education authorities see it as important to have clear plans prior to the availability of lottery-funded training
- there are some imaginative developments within schools and education authorities' but both are also aware of many challenges related to the financial commitment needed to maintain hardware and software.

Some headteachers and education authorities have mixed feelings about the value of whole-school policies on ICT but many schools and authorities are developing them.

What kind of ICT policies or planning does your school or education authority have for developing ICT?

The way forward

It is clear that teachers have different kinds of needs in relation to ICT development. To be skilled and knowledgeable is of course the key to effective implementation of ICT in teaching and learning and there is no doubt that Scottish teachers in the sample are motivated and interested in developing their own skills and knowledge. Messages coming from teachers, headteachers, librarians, technicians and education authorities indicate that effective development of ICT skills and knowledge, and enhanced use of ICT in schools, require a mix of:

- appropriate training (appropriate in terms of skills, knowledge, relevance to educational goals and priorities, and delivery)
- ready access to ICT
- ongoing support and advice to encourage progression beyond initial training.

Each of these needs to be set within a culture which encourages change but at a pace appropriate to teachers and schools.

Teachers need to be encouraged to reflect on, and make decisions about, their own ICT development needs on an ongoing basis.

Do you feel that you could enhance your own personal and professional development?

Training and development

Teachers responding to the survey identify a need to develop more confidence in using the technology as a necessary prerequisite to exploring more effective ways of using ICT in the classroom. It is clear that for many their own priorities are still for more technical skills and knowledge despite the fact that many have received some basic ICT training. However, training needs to present ICT convincingly as a vehicle through which the curriculum can be developed and delivered rather than a separate entity.

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As might be expected, the majority of teachers are also currently very much focused on their role in the classroom. Their views of the potential and value of ICT tend, therefore, to be concerned with its use with pupils. Yet the effective teacher, as in any other profession, plays a number of roles: s/he is not only a classroom practitioner but is also a manager, a planner, and a learner. If ICT is to be used to its full potential, future training initiatives will need to reflect these four roles.

Many teachers in this study are at the stage of using ICT to enhance their effectiveness, however, very few show evidence of radically questioning the way they teach and the educational environment in which they operate. Future approaches to training should therefore encourage reflection; should emphasise benefits to teachers as well as pupils; and should encourage more decision making and self-assessment on the part of teachers.

Recommendations

If appropriate use of ICT is to increase, we recommend the following action:

- future training and development opportunities should focus on:
  - i) applications and benefits for pupils and teachers and not simply on how to use the technology
  - ii) broadening awareness of a wide range of ICT resources, with less emphasis on word-processing and more on resources which are currently under-used
  - iii) ICT as a tool for lifelong learning for teachers as well as for their pupils
  - iv) information literacy as well as ICT literacy – by focusing on the content of ICT and not only on the technology, teachers will become more aware of the value and benefits of ICT to themselves and their pupils
  - v) relevancy – focused on the types of ICT resources likely to be available to teachers in school
  - vi) enabling teachers to work with a range of computers and operating systems
- teachers need to be encouraged to reflect on, and make decisions about, their own ICT development needs on an ongoing basis. This will ensure more involvement and ownership, and greater integration of ICT within the teaching and learning process
- training and development opportunities must be flexible by allowing choice and guidance where appropriate for teachers who are at different stages of ICT literacy, who teach different levels and curricula, and who are at different stages in their own career progression
- opportunities for continuing professional development (CPD) need to be available on an ongoing basis, i.e. not only the one-off event but also opportunities for teachers to continue to develop at a pace which suits their local circumstances and resources
- teachers need to be encouraged to integrate self-development of ICT skills and knowledge into their normal development planning.

Access to ICT

Access is seen as a particular barrier to the effective use of ICT.

How would you seek to find solutions to problems of access in your own environment?

Ready access to ICT is not simply a matter of providing more ICT resources. Much can be done to ensure that existing resources are managed more effectively to increase awareness and access. There is likely to be no single approach which would be right for all schools and it is therefore important that teachers and managers are made aware of the need to consider such issues in relation to their own school. Librarians and technicians will also have a role to play in information and ICT management. Staff development and training can help by focusing attention on these issues and by disseminating examples of good practice.

Recommendations

- systems are required in each school to publicise and inform all teachers about the availability of ICT resources: teachers need to be made aware of the existence of ICT within their own school (e.g. location and availability), as well as its potential
- all schools, but particularly secondary schools, need to seek ways of sharing what are relatively expensive ICT resources: this could take the form of centralised cataloguing (with evaluative reviews) of resources even if the resources are held in different departments or centralised siting of multi-purpose, cross-curricular resources, such as the Internet, in the school library
- there is a need to build ICT into strategic planning and budgeting in each school: those already in managerial positions may find it useful to share experiences and guidance documents such as 'Using the Superhighways'[7]; it should also be built into the longer-term staff-development of all teachers whose careers progress along a management path
- education authorities, schools and/or SOEID should consider providing computers for use by teachers at home: access to a computer at home will encourage those who are motivated towards ICT to make greater use of ICT in school, by providing the space and time for development which is often lacking in a busy school day.

Support and advice

A number of more formalised models for support networks are beginning to emerge within education authorities.

What kind of localised support could you tap in to?

The need for ongoing support is also seen as an essential component of ICT development. It is clear that many teachers rely on colleagues for ICT support and advice. Primary schools have few other options with those in rural areas finding technical support particularly problematic. While peer support is an important ingredient in the success of any organisation, the over-reliance on a few overburdened colleagues clearly worries many teachers. Teachers in secondary schools have the opportunity to draw on the support of technicians and librarians but, at the end of the day, the support they are able to give depends on the quality of their own knowledge and skills. A number of more formalised models for support networks are beginning to emerge within education authorities and there is scope for more research into the kind of 'helpdesk' support which is likely to prove most effective for teachers.

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Support from the top is also essential. Teachers are well aware of the many competing claims on resources. They do not expect miracles in terms of resource provision. Much can be done, however, to ensure that they feel supported in progressing their ideas as far as possible, that there are fair and equal opportunities for training and development at whatever level can be realistically supported, and that there is someone they can turn to for advice when necessary. Headteachers have a particular role to play in stimulating this kind of supportive environment.

Recommendations

- support is an essential component: mechanisms need to be put in place to ensure that teachers have adequate access to technical support and advice, and to ensure that teachers do not feel that they have to become technical experts themselves. The support need not only be in the form of an in-school technician, but could take the form of one designated individual who also networks with others with similar roles
- mechanisms should be put in place to support teachers in identifying, selecting and evaluating the ICT resources appropriate to their needs. Methods which allow teachers themselves to disseminate their knowledge and critical appraisal of materials are likely to be particularly effective
- the new Scottish Qualification for Headship (SQH) should address the need for all headteachers to be ICT literate. Headteachers have a particular role to play in encouraging the use of ICT – they in turn need to be aware of the benefits of ICT across the school, in all contexts, and can set examples by being seen to be using ICT themselves where appropriate.

Conclusion

The teachers encountered during this study are motivated and interested in developing ICT skills and knowledge, primarily because they feel that ICT has much to offer their pupils. However, the provision of a localised, supportive environment which encourages teachers to see ICT as integral to the achievement of their existing goals is likely to be as important as any single major training initiative.

In the words of one secondary teacher:

> *"I'm looking forward to a stage where this kind of buzz dies down a bit, and computers are just looked upon as another tool, and people relax into it."*

End Notes

[1] In Argyll & Bute an Intranet-based on-line support group, Mac-Net, has been highly praised by teachers; West Lothian's CREATIS project focuses on the enhancement of ICT provision across all schools, libraries and community education centres in the authority; and a pilot project using the Apple Classrooms of Tomorrow (ACOT) approach is currently being conducted at St Andrews High School in Fife.

[2] SOEID Superhighways Task Force, *Scottish Schools: Using the Superhighways - ICT & Development Planning*. Edinburgh: SOEID, 1998. Since the report was written these guidelines have been sent out to all Scottish schools.

Aknowledgements
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Further information
For full report please see Scottish Office Web Site: http://www.scotland.gov.uk/library/ict/append-title.htm

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